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NOTES FROM MILLPORT MARINE BIOLOGICAL STATION.

By Richard Elmhirst, F.L.S., Superintendent.

The Whelk (*Buccinum undatum*) as Food of the Cod (*Gadus callarius*).

While examining the contents of some Cods' stomachs from off the south end of Bute I was struck by the large number of opercula (door-plates) of the Whelk or Buckie present. It is well known that Crustacea constitute the greater part of the Cod's food (see "Second Report on the Food of Fishes" (North Sea, 1904–5, International Fishery Investigations), by R. A. Todd); although, there, two cases are recorded in which large numbers of Whelks are present. Mr. McNeil, the line fisherman, who caught them, informs me that Whelks are very abundant in that locality; certainly a great number do come up on the lines, and are used for bait. When used for bait the operculum is generally cut off, although I have found opercula inside Cod which certainly had been on bait, as they had been cut in two by a knife. Now, the number of opercula present indicated beyond all doubt that they had not all been taken as bait. On one occasion thirteen stomachs yielded fifty-two opercula, one four-pound Cod containing as many as fourteen.

Knowing the difficulty of extracting a live Whelk from its shell without breaking it, I wondered how the Cod got them out. Dr. Malcolm Laurie suggested that the Cod seized the live Whelks and pulled them in two. To try this in the aquarium, I seized a well-expanded Whelk behind the foot and gave it a sharp shake, with the result that the Whelk broke in two, leaving the foot in my hand, just as it occurs in the Cod. The Cod then, I think, seizes the Whelks when expanded, and gives them a sharp shake, so getting rid of the shell, but losing the softer parts of the meat. Some other fish shake their prey.

FEEDING HABITS OF THE CONGER-EEL AND SOME OTHER FISH IN CAPTIVITY.

In the aquarium Congers feed readily on such fish as Saithe (*Gadus virens*), Lythe (*G. pollachius*), and Goldsinny (*Ctenolabrus rupestris*). They generally seize their prey about the middle of the body, then by a sudden snap transfer their hold to the head, and then swallow it head first. I have once seen a relatively small Saithe (about six inches long) swallowed tail first.

Congers do not take mollusc food, such as shelled Mussel or Limpet, unless very hungry. In winter they hardly feed at all, but in summer they will take a fish nearly every day.

The Ballan Wrasse (*Labrus bergylta*), in captivity, feeds readily on various Crabs, such as *Cancer*, *Carcinus*, *Portunus*, *Hyas*, and *Eupagurus*. If the Crab is a large one the Wrasse makes sudden rushes at it, and tries to snap its legs off so as to disable it. If the Crab is not too big the Wrasse seizes it and dashes it against the bottom or rockwork of the tank, thus knocking off the limbs and breaking the shell up; the limbs are eaten later. I have had two Wrasses in captivity for nearly a year and two years respectively. Last year number one resented the presence of the new-comer, but has become more friendly now. Under natural conditions I think each fish has a home in the rocks, which is guarded against strangers.

Goldsinnies (*Ctenolabrus rupestris*) behave in a similar way. I have seen them attack Fifteen-spined Sticklebacks (*Gasterosteus spinachius*), seize them, carry them about, and shake them viciously. They also readily attack Gobies and young Gadoids, even pulling pieces off the tails of fish much larger than themselves.

BRITISH MUSEUM

If single valves of Mussels with flesh attached are put into the tanks, Plaice, Dabs, and Saithe will all shake them vigorously in trying to get the flesh out. When the Lemon Dab (*Pleuronectes microcephalus*) snaps at or seizes food a peculiar noise is made, which sounds rather as though one had hit the masonry of the tank with a hammer below water. The noise made is a distinct "plunk," and might be represented by that word. Dr. J. F. Gemmill and I have succeeded in closely imitating the noise by snapping one's fingers under water. We also produced the noise, though more faintly, by putting our heads under water with the mouth shut, expanding the back of the mouth and throat and then opening the mouth suddenly. This is as nearly as possible an imitation of the action of the fish when feeding, only the fish does it much more quickly. The Ballan Wrasse occasionally makes the same noise.

Cobblers (*Cottus scorpius*) feed greedily on mollusc or crustacean food. They readily attack strangers in their tanks, and swallow Pipefish (*Syngnathus*) or Saithe as long as or even longer than themselves, although it takes three or four days to finish the operation.

Sandhoppers (*Gammarus*), which can be gathered in thousands in the higher reaches of the tidal zone, are a favourite food with most fish in captivity (*e.g.* Cobbler, Pogge, Goby, Shanny, Butterfish, Ballan Wrasse, Goldsinny, Cod, Saithe, Lythe, Rockling, Topknot, Plaice, Lemon Dab, Dab, and Sole). Shrimps and Prawns, alive or dead, are also readily taken. Lythe show a stronger taste for crustacean food than Saithe do.

Dragonets, Anglers (*Lophius*), Skate, and Dogfish do not feed at all readily. Witches and Long Rough Dabs are very difficult to keep in captivity, and generally only live two or three days.

ADDITIONAL NOTES ON FLYING-FISH.

By Lionel E. Adams, B.A.

Since a note of mine on the flight of Flying-Fish appeared in 'The Zoologist' (1906, p. 145), Lieut.-Col. C. Durnford has sent me copies of his two able and interesting papers on the same subject.* As his observations differed slightly from my own, I was glad of the opportunity of further careful and prolonged observation on a recent voyage to the Plate.

In describing the flight (as it appeared to me) in my previous note, I said that the tail continues to vibrate during the whole period of the flight, and that the extended wings have intervals of rigidity alternating with vibratory motion. Col. Durnford maintains that these intervals of apparent rigidity, which give the flight the appearance of that of a bird sailing with outspread motionless wings, are really periods of increased rapidity of vibration, which my eye is unable to detect, and he points out that the capacity for perceiving the vibrations differs in individuals.

It has been ascertained that an impression lasts on the retina from one-fiftieth to one-thirtieth of a second, so that a greater number of vibrations than thirty to fifty per second would cause the images to overlap and create the impression of a blur; but if the number of vibrations was exactly adjusted so as neither to overlap nor to leave gaps, the result would be an image of the vibrating object at rest. Thus it is quite possible for two observers, whose visual capabilities vary, watching the same flight to differ as to the vibration or rigidity of the wings. If this is a correct explanation of the difference in opinions, it would give the rate of vibration of the wings at not less than thirty per second, since some observers (the aeroplanists) cannot perceive any wing movement; and not more than fifty per second, since Col. Durnford (and doubtless others) can perceive vibration during the whole flight.

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* 'Annals and Mag. of Nat. Hist.' January, 1906, and November, 1906.

Mr. F. M. Duncan, the cinematograph specialist, informs me that "the number of separate images per second required to give a non-jerky motion picture on the screen averages sixteen per second; that is the speed of all ordinary cinematograph pictures, and is all right for general work of simply showing the picture as a whole; . . . of course the number would be governed by the speed of the movement. For the flight of a Flying-Fish you would probably require from twenty-four to thirty-six pictures per second." This, however, refers to the movement of the fish as a whole, and not to the vibration of the wings, as Mr. Duncan says further on in his letter: "Some four years ago I was able to closely watch the movements of the Flying-Fish, and I came to the conclusion that its 'flight' was very like that of a Swallow skimming over a pool of water, *i. e.* a swift gliding motion, with from time to time a vibratory movement of the wings of very short duration, sufficient to produce an upward movement to carry the fish over the crest of a wave." This is, of course, how the aeroplanists see the flight.

With the special object of examining what I have described as "intervals of rigidity," I spent many hours daily watching the flights with a good glass, and the result was a confirmation of my previous experience; that is to say, there were in most flights short periods of soaring with motionless wings, but sometimes I could distinctly follow the vibration of the wings throughout the whole of the flight. Possibly if Col. Durnford had been with me he could have detected vibration during the periods when I could not. I quote from my notes made at the time:—"When the fish leave the water the flutter of their wings may be seen very distinctly; this movement becomes more and more rapid till it is often difficult, though not always impossible, to distinguish movement. This movement, which is apparently a mere shimmering, sometimes seems to cease altogether for a second or two." This note relates to my experience of the large "four-winged" species, which is the more common in the Atlantic, and which is easier to observe than the "two-winged."

It may be as well to explain the terms "four-winged" and "two-winged," which, though not scientific, are commonly understood; each may include several species as known to science.

The "four-winged" fly with the ventral fins extended, but whether these vibrate like the pectorals I cannot say; they always appear to me to be motionless. In this group the pectorals and ventrals are of an opaque indigo colour with colourless, transparent patches at or near the insertions; I have also noticed the pectorals of some to be a dull ochre mottled with dark spots.

The "two-winged" fish are smaller, and do not apparently extend the ventrals in flight; both pectorals and ventrals are of a very pale transparent blue tint.

There are several circumstances which increase the difficulty of observing the wing movement in flight.

The fact that the fish is nearly always viewed from above and that the light strikes on the glistening surface tends to confuse the sight. On one voyage, however, I was able to watch the flight from below, in very rough weather, from the deck of a small tramp steamer in the Arabian Sea, and on this occasion for several days I watched the flights, when the vibration of both fins and tail was perfectly distinct. It was on this occasion that I paid particular attention to the mode of flight for the first time, because I had always read in "the books" that the fish soared or sailed like birds, and was surprised to see anything different.

The unfamiliar direction of the vibration of the wings, which instead of being up and down as in the case of birds is almost horizontal, also tends to confuse the sight; and the fact that usually the flight is viewed from behind or nearly so (the worst position for observation) must be remembered. On the comparatively rare occasions when I have seen Flying-Fish rise in their flight towards the ship and fly on board towards me I have clearly seen the flutter of their wings, although this has generally happened as the light was failing; mostly, of course, they come on board in the dark. Moreover, the fish bursts upon the sight suddenly from an unexpected spot, and so is some way off before the observer can get a clear sight of the flight, just as a bolting rabbit is out of range before the novice can get a straight shot. With a little practice, however, it is quite easy to bring the binocular to bear as the fish leaves the water.

If you handle a fresh specimen and open the closed wings you will find that they spread in the same plane as that in which the body lies. Col. Durnford likens the action of the opening and shutting to that of a fan, which is very nearly correct; by the way, it is difficult to see from a mechanical point of view how a purely horizontal, fan-like motion can propel the fish at all. I think the following attempt to describe the flight in detail will furnish the explanation that the action is neither quite horizontal nor quite fan-like; besides which the constant vibration of the tail must not be forgotten.

The line of the insertion of the wing is down the side of the body, and is almost perpendicular to the plane of the outspread wings; the uppermost ray of the closed wing becoming the foremost ray of the wing extended, the lowest ray of the closed wing keeping its position down to the body. The operation is difficult to describe clearly, but by actually opening and shutting the wings of a specimen rapidly it becomes evident that a certain amount of air must be caught in the closing and none in the opening, the wings acting like an oar "feathering," or like the hands of a swimmer who drives the water past him with his concave palms. However, the almost fan-like and horizontal action of the wings does not appeal to one as an ideal method of propulsion, and one cannot wonder that a high rate of wing vibration added to that of the tail is necessary to propel such a solidly built object as a Flying-Fish.

When about a hundred miles south-east of Pernambuco a rare specimen came on board, which I was lucky enough to secure, and which Mr. G. A. Boulenger was kind enough to identify for me as *Exocœtus furcatus.* Its peculiarity lay in the possession of two barbel-like appendages 2½ in. in length. I had never previously seen a specimen, nor had any of the sailors of whom I inquired, and the "Flying-Fish with whiskers" was much discussed in certain rendezvous of skippers in Montevideo and other ports of the Plate.

SOME MUD-FLAT BIRD-NOTES.

By A. H. Patterson.

That there is still much to be observed and noted concerning the ways and doings of our British wild birds I am strongly convinced. It seems, to me, a great pity that so little of the habits of certain additional species of small land-birds, notably of Warblers and allied forms, that will be listed in the next edition of Howard Saunders's 'Manual,' is likely to be detailed, for the uncontrollable impulse to pull trigger upon a rare straggler to this country leaves scant margin for dwelling upon its living interest. The slaughter of a rare bird and the possession of its skin prinpally interests one person, but there the matter may perhaps end for others who are little the wiser for its advent.

Unfortunately for myself, opportunities for watching land-birds are extremely limited; those which haunt the oozy flats of Breydon, however, come within easy range of my field-glasses, and, strange as it seems to me, all has not been yet written that might be said of common waders and equally commonplace swimming birds. Even the Gulls are prone to develop new habits, and change their tactics to suit new conditions of environment. For some years past it has been my practice, when a bit run down or in want of a mild excitement, to fling my gear into my old punt, up sail, and race away to the broad acres of mud and muddy waters, and when thereamong to push her nose into a "lump," slip in a stake to keep her from drifting, fling about me a bit of sacking, and watch the birds that muster around. On some days little is to be seen; at other times some goodly flocks of various species are about, and some hitherto unknown or unobserved incident, to me, has thrust itself upon my notice.

I was much amused one August night by watching some old and some very juvenile Herons feeding in the "drains," then fast filling with the uprising flood. Like carven figures the adult birds stood "knee-deep," not a feather moving, save the plumy streamers on their wise old heads as the west wind toyed with them. At various angles they stood, ready to thrust forth neck and bill with lightning speed the moment a heedless little Eel or Flounder came within striking distance. There they remained for a considerable time without moving from the spot. The younger birds, less patient, marched along, seeking their prey, and, as may be imagined, with far less success. I have seldom been incorrect in judging the age of Herons by their fishing tactics. Occasionally, when conditions—the colour of the water and the direction of the wind (for Flounders frequent different sides of a stream according to winds, although not generally known)—offer a better opportunity than waiting, an adult bird will take the favourable side of a main channel or larger drain, and put out the small Flounders skulking on the sloping edge. When a Heron strikes an Eel too large to swallow with ordinary manipulation, it flies to a "rond," or a flat barely covered by the tide, and there resorts to hammering tactics, often dropping the protesting fish upon the ooze, well satisfied that it can easily snatch at it should it attempt to wriggle away. When five or six or more Herons are feeding in a drain, on either side of which the abrupt banks rise like miniature cliffs, there will be always one head held erect, and one bird on the *qui vive* against eventualities. I have often been amused watching from a boat or from the bank this grotesque head and neck sticking bolt upright, with no water or break in the flats visible, looking for all the world like a walking-stick thrust into the ooze and left there.

The Gulls (including Black-headed, Greater Black-backed, Common, and young Herring-Gulls) are often busy on the flood-tide gleaning up trifles, and then at rest on the grassy "lumps" for two or three hours straight off on the ebb-tide. Occasionally the Greater Black-backs leave the flotsam, and on the low water start "crabbing" on the flats, marching in a row as if beating the ground in proper order, throwing over-hand, or rather beakful after beakful of *Zostera marina,* bringing to light the Shore-Crabs that have been hiding beneath the prone vegetation to await the next flood-tide. It is odd to see them separating the squirming crustaceans from the tangled "grass." They sometimes pack their crops full of Crabs, which they kill by a deft squeeze, crushing in the middle of the carapace, where even a pin-thrust would prove immediately fatal. Sometimes they will continue this pursuit when the next tide has floated them off their feet. It is then still more curious to see them trying hard to *dive*, performing that operation as clumsily as a woman throws (Norfolk, *hulls*) a stone. The Crab, which is seen by the keen eye of the bird with head held at an oblique angle, is seized as it tries to scuttle away, but in almost every instance with several fronds of the tough *Zostera* around it; then the bird queerly struggles to obtain its equilibrium, still holding the grass, with its prey, between its mandibles—in fact, is anchored with the head below the water. In some instances it has to let go everything to regain its breath.

Now and again, on fine August days, the Black-headed Gulls go "a-worming." The ooze is alive with millions of small red ragworms, *Nereis diversicolor* (?). I have observed a hundred Gulls, extending a long distance, quartering the ground with some semblance of order and method. Whether they detect any movement in the ooze, or their instinct tells them that in every tiny hole a worm is to be found, I cannot say; the worms seldom show above the surface unless after a heavy downpour of rain, when thousands are to be seen, blood-red and conspicuous, upon the mud; it may be washed out, or it may be tempted by the refreshing shower. The Gulls must at such times devour myriads, but they are so easily digested that a three hours' feed would seem to leave the birds as hungry as at the beginning. A worm is pulled out at every second or third step.

I noticed some very peculiar performances on Aug. 21st, 1907, when a couple of Greenshanks were feeding not far from my houseboat. One bird, leisurely working, persistently hopped along on one foot. It did this for so long—a score yards at a time—that I decided in my own mind it had had a leg shot away. It was presently hailed by another, that came *hopping* along to join it, and the two jogged along in this needless and silly fashion. I was still puzzled at the oddity of the coincidence, when the resting leg was dropped, and for a moment or two these birds stood listening to something that had attracted their attention. I have since seen the Greenshank exhibit the same leg-saving methods.

The Redshanks' habits are always worth watching; many of them are so well known that I need not refer to them.

Whether it carries its young as the Woodcock does at times I am not sure, but I strongly suspect it; nor can I yet fully satisfy myself how it is that so few eggs or young birds come to grief on our East Coast marshes. It is a wonder to me that a solitary nest should escape intact, seeing that it is often planted in the midst of rambling bovines. I feel assured that a bullock will avoid treading upon a bird if possible to do so, and have observed them on a marsh deliberately step out of the way of a parcel of Gulls that refused, or did not attempt, to move out of their line of feeding.

The Redshank is a busy little bird at feeding-time. When "worming" on the ooze he likes to keep just in advance of the lifting waters that creep stealthily, inch by inch, over the flats. He makes a series of detached figure eights when stepping along, lifting his head after every thrust or twist. The Greenshank also makes figure eights, but joins them in continuous line. His favourite resort is a small tide-pool left in the mud—"lows" our Breydoners call them. Every inch of it will he work until satisfied that every hiding Shrimp has been ousted out and nabbed; he also delights to start at the beginning of a trickling-out drain just wide enough to reach on either side of him. He then pursues the drain downwards, steadily and industriously zigzagging as he goes. He is more petulant and restless than his cousin the Redshank.

The Knot is a lazy bird, very companionable, and never hurries himself, either at feeding, waking, or getting out of the way of danger. I never observed a slower bird at "worming." When feeding he will probe the mud three or four times in succession before shifting a foot to another spot. No greater contrast can be seen than when a Knot and a Ringed Plover are hunting together. The Ringed Plover probes a hole and seizes his worm, or maybe withdraws his short bill without one, and immediately trots off two or more feet and probes again. The Knot will be leisurely probing some six square yards, while the other will be scouring a good square acre.

The Whimbrel is a bonnie bird; noisy and merry, he seems as light-hearted as a schoolboy in the month of May, when he is most in evidence with us. No bird "calls" more when feeding on our flats, and in between his shrieking call-notes chuckles his tittering trill of pleasure. I watched a flock on May 14th, 1908, feeding on a mud-flat. Several had drawn up one leg, like the Greenshanks, and were hopping about after small Crabs, their favourite prey. I noticed that whenever one overbalanced his "centre of gravity," rather than put down the other leg, he spread his wings to preserve his equilibrium. I observed, however, that when the rising water crawled up the leg, both were used to get upon the wing. The way they manipulate small (acorn-sized) Crabs is very interesting to watch. The crustacean is shaken and kneaded, and the legs dropped, either from fright or from the jerk, until the carapace is entirely denuded of them. Then with an upward lift of the mandibles the "body" passes into the gullet and disappears, each now harmless leg being carefully picked up and swallowed. By this method not only is the Crab reduced to easily swallowed dimensions, but all chances of nipping are at an end.

I will mention but one more *acquired* habit, and wipe my pen, to be resumed, I hope, at a future date upon a theme so interesting to myself. The parish steeple at Yarmouth has for some years past been tenanted by an increasing number of Jackdaws. Something like eight pairs have this year started to nest. Below the church spreads out a large open market-place, wherein, at night, a row of chipped potato stalls tempt the lover of cheap and light refreshments to speculate. Every morning, in the early hours of daylight, these birds drop down to search for thrown-away or dropped chips, finding a ready and palatable breakfast to be had for the trouble of picking it up.

Spoonbills at Yarmouth.—Early in the third week in April three Spoonbills made their appearance at Yarmouth. On one occasion they alighted in a tame and confiding way upon the edge of the Marine Parade, and for a time wandered about upon the small sand-dunes south of the town, a most unusual spot for such birds. They then found their way to Breydon flats, where they remained for some days. When I saw them (on the 19th) they were restlessly feeding, now "croming" down a drain, and now scrambling up on to the flats and bibbling in amongst the *Zostera.* A Greater Black-backed Gull had joined them, remaining in their company all the afternoon. One bird was fully adult, and had a very fine mop of a crest.

ON THE HYMENOPTEROUS PARASITES OF RHYNCHOTA.

By Claude Morley, F.E.S., F.Z.S.

The following account of the species of Rhynchota which are destroyed by parasitic Hymenoptera claims to be no more than a basis of future work upon this fascinating subject. In due time I anticipate that the intercourse between these vampires of the air, whose lives depend entirely upon the extermination of other insects, and the remainder of entomological Orders will become of considerable moment to the horticulturist and farmer. That their restrictive influence upon the propagation of injurious insect-pests is far greater than any that can be directly exercised by man must be instantly granted, in so far as the natural is invariably more efficient than the artificial. Were it but possible to rear these most beneficially destructive flies in confinement and distribute them to localities suffering from the undue abundance of, say, the Hop Fly, Rose Aphis, or the various species of Coccids that at times are so fatal to our fruit crops, we should let loose a natural ally the importance of which has never yet been fully appeciated, because so little known. In California, I believe, they are beginning to attempt something of this kind with an ichneumon fly called *Ephialtes carbonarius* in relation to the Codlin Moth, so destructive both there and here to the fruit of apple-trees. Personally, I am persuaded that in Britain the more efficacious ally is *Pristimerus vulnerator*, which I myself have bred in some numbers from stored codlin-infested apples. The first difficulty, however, is in the production under semi-artificial conditions of these extremely shy and retiring flies, which delight in freedom, space, and sunshine. I have bred both sexes from their natural host in some numbers, and attempted to bring about satisfactory nuptiæ, even going the length of introducing a live and apparently tempting young host-larva. All has invariably been in vain. I have upon but two occasions in the course of ten years' observation seen parasitic Hymenoptera *in cop.*, and in both with no intervention from myself.

In the present paper I have contented myself with indicating, with detail wherever such was obtainable, the species of Hymenoptera preying upon the various sorts of Rhynchota, as recorded by the authors to whom I have had access. Probably there are a great number of other records: I have not seen them. To Prof. B. Oshanin of the St. Petersburg Academy of Sciences, to Robert Newstead, Esq., the learned author of a monograph upon the British Coccidæ, to Ernest A. Elliott, F.Z.S., and other gentlemen I am greatly indebted for valuable information.

Extra-British hosts are denoted by a suffixed asterisk.

HETEROPTERA.

1. PENTATOMIDÆ.

At least four species of the Proctotrypid genus *Telenomus*, Hal., are known to pass the early stages of their existence within the eggs of uninstanced species of this family. These are *T. cultratus*, Mayr (Verh. z.-b. Ges. 1879, p. 699); *T. phalænarum*, Nees (Gaulle, Cat. Hym. France, 1908, 115); and *T. pentatomæ*, Rondani (Bull. Soc. Ent. Ital. 1874, p. 135, et *l. c.* 1877, p. 199).

2. *Tectocoris lineola*, Fabr., var. *banksi*, Don.*

Dodd suggests (Trans. Ent. Soc. 1904, p. 485) that the "brooding" habits of the maternal *Pentatomidæ* serve as a protection against Hymenopterous oviparasites. He says: "I have frequently had ova of Hemiptera produce *ichneumons*."

3. *Eurygaster maura*, Linn.

Telenomus sokolowi, Mayr (described in Horæ Societatis Ent. Rossicæ, xxx. (1897), p. 442; *cf.* Sokolow, *lib. cit.* p. 444 et Traveaux du Bureau d'Entom. Petersburg, 1901, No. 17), at one time caused the almost total extinction of this Hemipteron in the Government of Charkow; the latter had previously become so numerous that the entire crops of wheat and rye were ruined by it, and in some parts the peasants had had to abandon their cultivation. Prof. Oshanin tells me that the allied *Telenomus semistriatus*, Nees, is also parasitic upon the same species' eggs in the Crimea, according to M. Mokrzecti.

4. *Eurygaster integriceps*, Put.*

In like manner the latter species also preys upon the eggs of this Pentatomid, which occasionally causes great damage to wheat in Southern Russia, the Caucasus, and Turkestan; and it is assisted in its beneficial economy by *Telenomus simoni*, Mayr, *T. vassiliewi*, Mayr (Verh. z.-b. Ges. 1903, p. 389; et Vassiliew, Trav. du Bureau d'Entom. iv. (1904), No. 11), and *T. rufiventris*, Mayr (Hor. Soc. Ent. Ross. xxxviii. (1907), p. 158). It was reared from the bug's eggs collected in the district of Rostov, on the Don.

5. PENTATOMA.

A Chalcid, *Eulophus pectinicornis*, Linn., is doubtfully given (Gaulle, Cat. 109) as parasitic upon an undetermined species of this genus, but the association is unlikely. Its eggs are said to be destroyed by *Telenomus alcon*, Walk. (Ent. Mag. 1836, p. 353), since this parasite was bred from them at Paris by the Comte de Castleneau.

6. *Holcogaster fibulata*, Germ.*

Telenomus truncatus, Nees, preys upon the eggs of this species, according to Gaulle (Cat. 115).

7. *Eurydema oleraceum*, Linn.

The eggs of *Eurydema oleraceum* are said by Rondani (Bull. Soc. Ent. Ital. 1874, p. 135 et 1877, p. 187) to be devoured by the Chalcid, *Misocoris oophagus*, Rond.

8. *Eurydema festivum*, Linn.

Two other species of *Misocoris*, namely, *Pteromalus oomyzus* and *P. ovivorus*, are also described by Rondani (*loc. cit.* 1872, pp. 202–3, et 1877, pp. 186–7) from the eggs of both *Eurydema festivum* and *E. ornatum*.†

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† Several species of the Fossorial *Larrinæ* are known to provision their nests with the larvæ of *Pentatomidæ* and other Rhynchota, thus:—*Astata boops* with *Dolycoris baccarum* and *Eurydema oleraceum* — *cf.* Trans. Ent. Soc. 1836, p. 57; *A. costæ* with *Odontoscelis* and *Sciocoris*; *A. minor* and *A. rufipes* with *Sehirus dubius*, and the latter also with *Brachypelta aterrima*; *A. stigma* with *Emblethis griseus*; and *A. tricolor* with species of *Aphanus*. *Dinetus pictus* preys in like manner upon larvæ of *Nabis lativentris*; and, doubtfully, *Tachysphex* upon *Pentatoma* (*cf.* Gaulle, Cat. 134). This association cannot, however, be termed parasitism.

These gentle attentions are sometimes reciprocated; for Prof. Poulton found the Reduviid Hemipteron, *Harpactor iracundus*, Scop., to prey upon

9. *Apateticus maculiventris*, Say (= *spinosus*, Dall.).*

Ashmead describes (Bull. U. S. Nat. Mus. 1893, p. 158) *Telenomus podisi* from the eggs of this species in Missouri, and an allied parasite, *Trissolcus podisi*, from Pennsylvania (*loc. cit.* p. 162).

10. *Apateticus modestus*, Dall.*

This species is also said to be attacked by the former of the above Proctotrypids by Dalla Torre (Cat. Hym. v. 519), upon the authority of Riley and Howard.

11. *Thyanta custator*, Fabr.*

A Chalcid, *Eupelmus hirtus* (Proc. Amer. Ent. Soc. 1885, p. xiv), and a Proctotrypid, *Trissolcus thyantæ*, on its eggs (Bull. U. S. Nat. Mus. 1893, p. 163), are described by Ashmead.

12. *Anoplocnemis curvipes*, Fabr.*

In 'The Zoologist,' 1908, p. 193, Mr. H. W. Bell-Marley tells us, in his note on "Rhynchota and their Parasites in South Africa," that he found little Proctotrypid flies (figured, *l. c.*) of the subfamily *Scelioninæ*, which Col. Bingham considered to be undescribed, "resting upon this bug's body in a state of excitement, for they were running up and down the wing-cases and underneath its body." No explanation is given of this association, but Mr. Distant, in a note, refers to Ashmead's statement that all the species of *Scelioninæ* are strictly egg-parasites, though since the individual infested was a male, the cause of their presence is doubly obscure.

13. *Gerris lacustris*, Linn.

De Gaulle tells us (Cat. 110) that the minute Mymarid, *Limnodytes gerriphagus*, Marchal, devours the eggs of this aquatic species.

14. *Psallus variabilis*, Fall.

In my note upon the parasitism of this species (E.M.M. 1904, p. 184), I stated the opinion that the larva taken from its body was that of some Dipteron; subsequently Mr. Saunders wrote that it was a well-known mite, parasitic on Homoptera, one of

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the bees, *Halictus scabiosæ*, Rossi, and *H. mucoreus*, Ev., in Majorca and Spain, in July (Trans. Ent. Soc. 1907, p. 404); and on June 5th, 1908, I took *Gerris gibbifera* sucking *Tenthredo balteatus* on my moat at Monk's Soham.

the *Orobitidæ*. This I cannot credit, since it was very certainly apodous; and now I am strongly of the opinion that it belonged to the *Dryinidæ*, since it answered almost *ad amussim* to the description of *Gonatopus pilosus*, Thoms., given by Mik (Wien. Ent. Zeit. 1882, pp. 218–9).

15. *Ranatra linearis*, Linn. 16. *Notonecta glauca*, Linn.

The Mymarid, *Prestwichia aquatica*, Lubb., devours the eggs of both these aquatic species (*cf.* Trans. Linn. Soc. 1863, p. 140; 'Nature,' 1896; E.M.M. 1898, p. 152; Proc. Ent. Soc. 1899, p. xv.; *l. c.* 1900, p. xii.; Deut. Ent. Zeit. 1908, p. 137). Enoch found, on opening eggs of the latter species, that many imagines —Prof. Heymous says eleven to sixteen is the usual number, though Enoch once bred thirty-four in a single egg—were in each egg, and these swam about freely upon being liberated; in one he found copulation in progress before emergence (a unique circumstance in parasitic Hymenoptera, and one conducive to inbreeding). Their size is sometimes double that of others, though always equally fully developed.

HOMOPTERA.

17. *Cixius contaminatus*, Germ.

Dryinus formicarius, Latr.—"D'après Capron, cet insecte pourrait bien être parasite de *Cixius contaminatus*, Germ., ayant été capturé à Shiere sur un buisson d'Erable habité par de nombreux individus de cet Homoptère" (Kief. Procto. i. 79).

18. MEMBRACIDÆ.

Ashmead, in his "Classification of the Fossorial, Predaceous, and Parasitic Wasps" (Canad. Ent. 1902, p. 288), says that *Dryininæ* prey upon *Membracides*, though he instances no species. Dale's *Homopterophagus dorsettensis*, which he thought "must belong to the *Acari*," and is scheduled as such in the 'Zoological Record' for 1879 (*cf.* 'History of Glanville's Wootton,' 304) is most certainly a larva of the same subfamily (*cf.* also Kirkaldy, Entom. 1906, p. 14). Even Buckton (Brit. Cicad. ii. 40) was doubtful whether these sacs were *Proctotrypidæ* or larvæ of *Trombidia*.

19. CERCOPIDÆ.* †

Ashmead, as last referred to, includes this family in his above vague remark.

20. *Penthimia nigra*, Goeze.*

Penthimia atra is said by Lichtenstein ('Naturaliste,' 1880, p. 206) to be parasitised by the Proctotrypid, *Phanurus penthimiæ*, Licht.

21. ATHYSANUS.

From an undetermined species of this genus, Mik (Wien. Ent. Zeit. 1882, p. 215) bred the Proctotrypid, *Gonatopus pedestris*, Dalm. [*Cf.* also Perkins, Report of Experiment Station of Hawaiian Sugar Planters' Assoc., Divis. Entom. Bull. i. (1905), which I have not seen.]

22. *Athysanus plebejus*, Fall.

I took a specimen of this species near Ipswich on Sept. 13th, 1904, bearing a larva similar to that found on *Psallus variabilis* (*ante*).

23. *Athysanus obsoletus*, Kbm.

I swept a specimen of this species, bearing a black larva, probably of the same genus as the last-named Proctotrypid, from *Carex paniculata*, at Foxhall, Suffolk, on Aug. 13th, 1904. Mr. Butler tells me he has specimens of this species bearing *Gonatopus* larvæ, and remarks that all the species upon which he has noted such occur almost exclusively in the wettest situations.

† The Fossorial genera *Gorytes*, *Hoplisus*, *Harpactus*, *Alyson*, and *Stizus* are known to provision their nests with *Cicadinæ*, thus:—*G. campestris* and *G. mystaceus* provide the larvæ of *Philænus spumarius* for their own grubs to feast upon; *Hoplisus punctulatus* gathers *Selenocephalus obsoletus*; *H. laticinctus* and *H. sulcifrons* get *Philænus spumarius*, and *H. punctuosus* provisions its nest with various *Tettigometræ*; *Harpactus concinnus*, *H. elegans*, and *H. lævis* with *Selenocephalus obsoletus*; *H. exiguus* with *Acocephalus nervosus*; *H. elegans* also with *Athysanus variegatus*, *Hysteropterum liliimacula*, and a species of *Deltocephalus*; *H. lævis* with *Goniagnathus brevis* and *Athysanus variegatus*; and *H. tumidus* with various *Cicadinæ*. *Alyson ratzeburgi* preys upon *Falcidius apterus*; and *A. fuscatus* upon *Agallia venosa*, *Athysanus sordidus*, *Bythoscopi*, *Grypotes*, &c. *Stizus tridens* attacks *Idiocerus tæniops*, *Thamnotettix martini*, &c.; and *Crabro gonager*, like *Sphecius nigricornis*, also captures "Cicadines" (*cf.* Gaulle, Cat. 133–7, &c.). This association cannot, however, be termed parasitism.

In like manner *Psen* (*Mimesa*) *ater* provisions its nest with *Macropsis*

24. *Athysanus sordidus*, Zett.

Mr. E. A. Butler kindly informs me that he possesses specimens of this species containing larvæ of *Gonatopus*.

25. *Athysanus plebeja*, Fall.

His Chalcid, *Eupelmus cicadæ*, is said by Giraud (Ann. Soc. France, 1871, p. 413) to be parasitic within the eggs of *Cicada plebeja*. *Cf.* also Réamur, Mém. Hist. Nat. Ins. v. 4.

26. *Thamnotettix maritimus*, Perr.*

M. Perris gives an interesting account of the ektoparasitism of the above species upon this Jassid in his "Nouvelles Excursions dans les Grandes Landes" (Ann. Soc. Linn. Lyon, 1857, p. 172).

27. *Thamnotettix quadrinotatus*, Fabr.

Mr. Butler informs me that he possesses this species, parasitized by larvæ of *Gonatopus*.

28. *Deltocephalus assimilis*, Fall. (=*xanthoneurus*, Fieb.).*

A long account is given of the habits of *Gonatopus pilosus*, Thoms., from larva to imago, by J. Mik (Wien. Ent. Zeit. 1882, pp. 215–221); especially interesting is the observation that the hybernated larva strengthened its cocoon immediately before assuming the pupal state in the middle of May, showing a very late active period.

29. *Deltocephalus maculiceps*, Boh.

Specimens of this species in Mr. Butler's collection bear larvæ of *Gonatopus*.

30. *Eupteryx vittata*, Linn.

I swept a specimen of this species from reeds on the bank of the Orwell near Ipswich on Sept. 15th, 1904, which contained a larval parasite, probably Hymenopterous.

31. *Cicadula septemnotata*, Fall. 32. *C. sexnotata*, Fall.

Both these species have been noted by Mr. Butler to bear larvæ of the Proctotrypid genus *Gonatopus*.

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lanio, and *Mimesa* (*Psen*) *unicolor* with various "Cicadelles" (Gaulle, Cat. 130); while *M. bicolor* attacks a species of *Tettigonia* (Smith, Cat. Brit. Hym. 184, et Shuck. Trans. Ent. Soc. 1836, p. 57), probably *T. viridis*, Linn.

TYPHLOCYBA.

Riley has observed *Labeo typhlocybæ* (Ashm. Bull. U. S. Nat Mus. 1893, p. 89) to be parasitic upon an uninstanced species of this genus.

33. *Typhlocyba ulmi*, Linn.

On July 17th, 1904, I took a number of this species on elms on the outskirts of Ipswich, and find the following MS. note in my diary:—In one of these I discovered a white maggot, of certainly the same species as that taken from *Psallus variabilis*, but more fully developed. I sent it to Saunders, who thought it not Coleopterous, and too large for *Elenchus*. I think it Hymenopterous; the oral organs and segmentation are more distinct in this species than in the former.

34. *Typhlocyba douglasi*, Edw. 35. *T. hippocastani*, Edw.

The late Prof. Alfred Giard has given an excellent account of the parasitism of *Aphelopus melaleucus*, Dalm., upon these two species in his "Sur la Castration Parasitaire des Typhlocyba par une Larve d'Hyménoptère" (Compt. rend. Acad. Sc. Paris, 1889, p. 708; *cf.* also 'Insect Life,' 1890, pp. 271–3), in which he clearly shows that the genital organs are rendered abortive by the parasite's presence, in such a way that "wholesale parasitism" results as far as the succeeding generations are concerned.

36. *Typhlocyba rosæ*, Linn.

The above or probably an allied species is also referred to by Giard, "Sur une Galle produite chez le *Typhlocyba rosæ*, par une Larve d'Hyménoptère" (*loc. cit.* pp. 79–82). It is certainly a Proctotrypid of some kind.

37. *Pachypsylla celtidis gemma*, Riley.*†

From a Psyllid bearing this name Howard describes his Chalcid, *Encyrtus pachypsyllæ* (Descr. N. Amer. Chal. 1885, p. 15).

38. *Trioza centranthi*, Vall.*

André has given an account of breeding no fewer than three distinct species of *Chalcididæ* from this Homopteron, which shows how much there is to learn in this way. These are his *Encyrtus triozæ*, *Aphelinus* (*Agonioneurus*) *pictus*, which is doubtfully ascribed to Förster, and his *Tetrastichus obscuratus* (Ann. Soc. France, 1878, pp. 83–5; also Bull. Soc. Fr. 1877, p. cxix.).

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† Several species of Fossors provision their nests with species of the genus *Psylla*, but this can in no way be termed parasitism. Thus:—*Psenulus pallidipes*, *Passalæcus gracilis*, and *Crabro palmarius* are known to store up *Psylla alni*; and *Psenulus concolor* an undetermined species of the same genus (Gaulle, Cat. 129 et 137).

39. *Trioza magnoliæ*, Ashm.*

A Chalcid, *Encyrtus solus*, is described by Howard from this species (Descr. N. Amer. Chal. 1885, p. 15).

40. *Trioza diospyri*, Ashm.*

In the same work is also described *Encyrtus trioziphagus*, which preys upon the present species in the Colombia District (p. 14).

APHIDIDÆ.

41. SIPHONOPHORA.

Parasites have only twice been bred from unspecified members of this genus. First, Rondani described thence his *Chrysolampus aphidicola* (Ann. Sc. Nat. Bologna, 1848; Bull. Soc. Ent. Ital. 1877, p. 170); and, second, Ashmead brought forward (Canad. Entom. 1888, p. 104) his Tetrastichine Chalcid, *Anozus siphonophoræ*, from Northern America.

42. *Siphonophora rosæ*, Linn.

This abundant species is ubiquitously and directly parasitised by the Braconid, *Aphidius rosæ*, Hal. *Aphidius proteus*, Wesm., is given by Brischke (Schr. Nat. Ges. Danz. 1882, p. 182), *A.* (*Cœlonotus*) *pictus*, Hal., and *Praon exoletus*, Nees, by Gaulle (Cat. 86), and *Aphidius ervi*, Hal., is said by Marshall to also have been bred from it by Bignell in Devonshire; all these, if correct, are of far less frequent occurrence than the first species, and hyperparasites have been observed, though none of them from this host. A very full and oft-quoted account of the oviposition of *Aphidius rosæ* is given by Haliday (Ent. Mag. 1835, pp. 98–99); he says the female abdomen is telescopic, and the egg deposited on the under side of the puceron, near its tail; the female is able to tell if the host be already parasitised; the larva spins no cocoon, but the imago emerges from the indurated skin of its host. Buckton (Mon. Aph. Brit. i. 110) says both winged and apterous hosts are attacked, adding that the fly poises itself on the back of the Aphid during oviposition (*cf.* his *Aphidius cancellatus*, l. c. pl. iv., which certainly represents *A. rosæ*, female, whose habits are referred to at ii. 152). Bignell (Trans. Devon. Assoc. 1901, p. 688) bred *Aphidius rosæ* from this host throughout the summer. The hyperparasitic species are numerous, and the commonest perhaps is *Allotria victrix*, Wesm.,† which was first bred from it by Westwood (Mag. Nat. Hist. vi. p. 491 et Intro. ii. 132); this is probably the *Cynips aphidium* of Geoffroy (ii. 305, referred to by Haliday), and also Guérin's "black *Cynips* with a red head and rufous legs," mentioned by Buckton (Mon. ii. 150); it has further been bred from this host by Bignell in Devon, Brischke in Prussia, and Giraud from the Aphid of *Rosa canina* in France (Ann. Soc. France, 1877 (p. 416)); *Allotria flaviceps*, Kieffer, is doubtless nothing but a new name for it or for some trifling variety. Another common species bred from *Siphonophora rosæ* is *Asaphes vulgaris*, Walk., which was first bred by Haliday and subsequently in some numbers by Ratzeburg (*Chrysolampus æneus*, Ratz. Ichn. d. Forst. ii. 185 et iii. 228); as well as by Brischke (Schr. Nat. Ges. Danz. 1882, p. 182); it is common in England. Buckton figures (ii. pl. lxxxvi. fig. 5, ♀) *Coruna* (*Pachycrepis*) *clavata*, Walk., and says that it spins a cocoon of its own‡ between its dead host-Aphid and the leaf, the former being glued to it by its viscous secretions, as had already been pointed out by Haliday; but Marshall (Trans. Ent.

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† The Rev. T. A. Marshall (Ent. Ann. 1874, p. 119) says: "The species of *Allotria* are parasitic upon Aphides, in the same manner as the Braconids of the genus *Aphidius*" (*i. e.* not hyperparasitic through the latter). De Gaulle also gives the *Allotriini* as "Parasites de pucerons." But the former later (Bracon d'Europ. i. 44 et ii. 531) recognized them as hyperparasites; and Bignell (Trans. Devon. Assoc. 1901, p. 663) claims to have proved the fact by watching them oviposit in already parasitized Aphids, from which he subsequently bred *Allotria* only. Haliday (Ent. Mag. 1835, p. 99) clearly shows that he considered *Cynips aphidum*, Geoff., to be hyperparasitic, and *Cynips erythrocephala* to be a direct parasite of this species of Aphid; if this be the case, Buckton's assumption (Mon. Aph. ii. 153) that the former is synonymous with *Aphidius varius*, Nees, becomes untenable, and Marshall's synonymy with *A. rosarum*, Nees, equally faulty. Nees saw *Mesolata elongata*, Walk., oviposit in Aphides already containing larvæ of *A. varius*, according to Buckton (*l. c.* ii. 155); but I do not follow him, since no such genus exists in zoological nomenclature. Marshall shows in his table of hosts (Bracon. d'Europ. i. 42) that the *Aphidiinæ* is the only subfamily of the *Braconidæ* parasitic on Hemiptera.

‡ Buckton (Mon. ii. 155) says: "I have bred *Coryna* from the silken tent which it constructs under, and between the legs of, the dried larval

Soc. 1899, p. 15) considers this an error, since the cocoon referred to is almost certainly that of a species of *Praon*, which genus of the *Aphidiinæ* alone evacuate their hosts to pupate. Both Brischke and Reinhardt have bred this species from the same host. At least eight other species of hyperparasitic *Chalcididæ* are recorded:—Rondani describes (Ann. Soc. Nat. Bologna, 1848 et Bull. Soc. Ent. Ital. 1877, p. 194) a species bred by him, under the name *Pteromalus castigator*; and the same author is said by Dalla Torre (Cat. v. 165 et 525), with no reference, to have also raised *Chrysolampus* (*Merismus*) *rufipes*, Walk., and the Proctotrypid, *Ceraphron fuscipes*, Ratz. The former is probably a *lapsus calami* for *Sphegigaster rufipes*, Nees, recorded by Gaulle (Cat. 104), together with *S. aphidiphagus*, Ratz., and, from "*Aphis* sur rosier," *Tridymus aphidum*, Ratz. Undeterminable species of the genus *Encyrtus* were also bred by Buckton, and, in the United States, Howard (Revis. Aphelinæ of N. Amer. 1895, p. 24) says *Aphelinus mali*, Haldeman, preys upon *A. rosæ*, and *Blastothrix rosæ*, Ashm. (Trans. Amer. Ent. Soc. 1886, p. 130), has been raised from the var. *floridæ* of the same species. Three other Proctotrypids have also been raised from this host, and one of them, *Lygocerus carpenteri*, Curt.—with which Kieffer's "new" *L. testaceimanus* is doubtless synonymous—in some numbers in Britain by Marshall and Haliday; the others are *Trichosteresis clandestinus*, Nees, and *Megaspilus dux*, Curt. (B. E. fol. 249).

43. *Siphonophora scabiosæ*, Schr.

Dr. Giraud bred (Ann. Soc. Fr. 1877, pp. 427 et 434) *Pachyneuron aphidiphagus*, Ratz., and *Megaspilus aphidum*, MS., from *Aphides* sur *Dipsacus*; and (*l. c.* p. 415) a species of *Aphidius*, which he determines as *Ichneumon dipsaci*, Schr., and was probably the host of the above Chalcids, from a species of "*Aphis* sur *Dipsacus fullonum*." Buckton gives no Aphides as attacking this plant, but I have taken the present species abundantly on

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skin" of *Siphonophora rosæ*, though he was doubtful of its hyperparasitism. But he is quite wrong in saying (*l. c.*) that Nees "saw" the certainly synonymous *Chrysolampus suspensus* "emerge from the larva of *Aphis rosarum*." What Nees says, respecting his *C. suspensus*, is: "Metamorphosis in larva *Aphidii Rosarum*, ex quibus mihi die 2 Julii a. 1813 Sickershusi provenit" (Mon. Ichn. Aff. ii. 127), and (*lib. cit.* i. 19) of his Braconid, *Aphidius rosarum*, ". . . ex *Aphidibus Rosæ* exclusum obtinui."

stems of *Dipsacus sylvestris*, Huds., at the Havenstreet Woods, in the Isle of Wight.

44. *Siphonophora granaria*, Kirby.

Aphidius avenæ, Hal., destroys this injurious species in great quantities. A stem of barley I noticed in August, 1907, supported no fewer than fourteen females of this Aphid, every one of which produced the above parasite. Curtis says ('Farm Insects,' 291) that he bred it from a large testaceous female Aphid found on an ear of wheat in the middle of July, and that it emerged from near its host's anus. He mentions the habit of the male parasite of hovering over the plants infested with Aphids while the female is laying eggs upon them, which process is accomplished by bending her body under her breast so that, by lengthening her terebra, the spicula is produced under the Aphid, and an egg instantly inserted in its belly near the tail; such of their hosts as are already inoculated are passed over. He refers to Haliday (Ent. Mag. 1835, p. 99), who, however, simply says that he has bred it from Aphids on *Avena sativa*, and observed the proceedings of this species to be precisely similar to those of *Aphidius rosæ*: "the Pucerons pierced by it are found adhering to the grains of oats," &c. Curtis (*l. c.* 292) records *Ephedrus plagiator*, Nees, whose habits were unknown to its author and Haliday, from the same host, and remarks that it oviposits in the back of its host. He also refers to a hyperparasite through this *Ephedrus*, and describes it as *Ceraphron carpenteri*; and Buckton, who was doubtful respecting the determination of his direct parasite with *E. plagiator*—it is said by Marshall (Trans. Ent. Soc. 1899) to be "very different from an *Ephedrus*"—gives (Mon. Aph. i. 118) an interesting account of the oviposition of this hyperparasite, which he synonymises with *Ceraphron clandestinum*, Nees: it extends, he says, over a period of at least ten minutes after the host's skin has already been pierced. A third direct parasite is known to be *Aphidius granarius*, Marsh., who says (Bracon. d'Europ. ii. 579) that Bignell bred eleven specimens of both sexes in the middle of August, 1883, and of June, 1884, from this host on several kinds of *Graminaceæ*. A species of *Entedon* with black feet is also mentioned by Curtis (F. Ins. 294) as a probable parasite of this Aphid, though his *Dacnusa cerealis* (*Blacus ambulans*, Hal.) had more probably attacked Diptera. In America, *Siphonophora avenæ*, Fabr., is said by Howard (Ins. Life, 1890, p. 247) to be destroyed by his *Pachyneuron micans* and *Encyrtus websteri*; Ashmead has recorded (Bull. U. S. Nat. Mus. 1893, p. 110) *Lygocerus niger*, How., from it; and Dalla Torre gives (Cat. v. 535) *L. triticum*, Taylor, in the same capacity, on the authority of Riley and Howard. *Pachyneuron* (*Diplolepis*) *aphidis*, Bouché, given by him "Habitat in Aphidibus graminis" (Naturg. 170), must be noticed here; it was ascribed to *Pteromalus* by Nees, and to its present genus by Reinhardt (Stett. Ent. Zeit. 1859, p. 192).

45. *Siphonophora chelidonii*, Kalt.

Two species of the Aphidiine genus *Praon* are recorded from this Aphid by Marshall; *P. longicornis*, Marsh., is represented by a single male, raised by Bignell in Devon, as the latter tells us, on Aug. 23rd, 1883; and the common and polyphagous *P. volucre*, Hal., whose hyperparasites are *Allotria ullrichi*, Gir., *Isocrates* (*Asaphes*) *vulgaris*, Walk., and an ined. or indeterm. species of *Lamprotatus*, Westw.

46. *Siphonophora hieracii*, Kalt.

Our only record of parasites upon this species is doubtful, being based solely upon Curtis's mention (B. E. fol. 283) of *Aphidius picipes*, Nees, bred from the Aphid of "*Hieracium?*."

47. *Siphonophora millefolii*, Fabr.

Bignell alone has brought forward (Trans. Devon. Ass. 1901, p. 689) his breeding of *Aphidius longiceræ*, Marsh., from Aphids upon feverfew. This species often covers that plant in my garden at Monks Soham, and I have never found another upon it.

48. *Siphonophora pisi*, Kalt.

Two, probably three, species of direct parasite prey upon this species. *Aphidius silenes*, Marsh., was bred thence by Bignell, in Devon, on July 6th, 1883, and *A. loniceræ*, Marsh, emerged from the same host upon the same day; Haliday bred his *A. ervi*, which is a very common species, "copiose" from Aphids on *Trifolium*, probably the present species or *Megoura viciæ*, Buck. I have also received the first-named parasite from Mr. W. E. Collinge, who bred six specimens from apterous females of this Aphid at Birmingham in October, 1907.

(To be continued.)

NOTES AND QUERIES.

MAMMALIA.

An Instance of Affection evinced by Ferrets for their Feeder.— Some years ago, when I used to keep Ferrets, I found that they were subject to take distemper from any dogs suffering from that disease, and none attacked by it ever recovered. I had a doe Ferret (very tame and a great pet) which some weeks after having a litter of six young ones was unfortunately attacked by that disease, the infection being communicated by a young retriever that had access to the room in which the Ferrets were kept. The poor animal, after suffering for some days, died, leaving the six little ones to starve; these were very small, only about five inches in length, and so young that their eyes were still unopened. However, not wishing to see the little creatures die of starvation, my sister made a nest for them of some woollen cloth lined with wool, and placed in a box near the kitchen fire, and after a great deal of patient trouble induced them to take a little milk from a teaspoon, though at first it had to be put into their mouths, until they began to drink from the spoon. This mode of feeding was continued for over a week, when I thought of giving them soft meat with the blood in it and chopped up into a pulp, so that they could suck it down. I began with rabbits' livers, taken from fresh-killed rabbits and pulped while warm, so that the blood was well mixed. It was extraordinary to see with what avidity the little blind creatures took to this food along with the milk, and they improved so rapidly on it that I continued it until their eyes were open, and they were able to feed on the usual food of soaked bread and milk. On account of being hand-fed from so young an age they grew up very tame and gentle, and evinced the greatest attachment to my sister; so much so that, when they were nearly full-grown, she used on fine days to take them out for exercise on the lawn, when they would follow her about like a pack of little hounds, and, as the haymaking season was on, she would at times sit on a haycock while the Ferrets were playing about, but they never went any distance away or out of sight. Frequently, to amuse herself and friends by testing the affection of the Ferrets, she used to run away, as if deserting them, when they would stream after her in full cry, like a pack of little hounds, all emitting the querulous cry of fear at being deserted, while it was amusing to see their delight when she waited for them. They were the most interesting little animals I ever kept, were perfectly clean, and emitted no offensive smell whatever. When they were full-grown I parted with five, keeping only the little doe, which turned out a first-rate working Ferret; but unfortunately, to my great regret, she also, like her dam, died of distemper.—ROBERT WARREN (Moy View, Ballina).

AVES.

Ring-Ouzel at Yarmouth.—On April 25th I received a fine adult male Ring-Ouzel (*Turdus torquatus*), which was killed by striking the telegraph-wires at Cobholm, Yarmouth. Another had met with a similar accident in the same locality in October, 1908. I have reason to believe that this bird meets with its death in the above-named way much more often than the Blackbird, which is its nearest ally.—B. DYE (Great Yarmouth).

Some Bird-Notes from Ballina.—Our spring weather began very cold and wet; there was frost every night from March 1st to the 9th. The coldest night was that of the 6th, when the mercury fell to 27°, the weather keeping very cold and broken; we had frost again on the nights of the 16th and 20th. Rain fell every day from the 17th to the 31st, except on the 20th, 22nd, and 30th, which were dry. April began with three wet days, followed by a dry week, and then fourteen wet days. This cold and wet weather delayed the arrival of many of our spring migrants; yet some appeared in good time. Sandwich Terns were seen near Bartragh the first week in April, though I did not observe any in the estuary until the 12th, when only a pair appeared. On the 14th a pair of Swallows arrived in their old haunts here, and a Chiffchaff was heard in the garden on the 12th. Mr. C. Scroope, near Ballina, heard the latter on the 6th, and Willow-Wrens on the 17th. May began very cold, with two wet days, but subsequently the weather changed, and then up to the 11th we had cold, harsh, drying north and north-east winds which checked the growth of the grass, so that the outlying cattle and sheep experienced hard times. The Corn-Crake and Cuckoo were both late in this locality, not being heard until the 2nd inst., while up to the 20th I did not hear a Willow-Wren, though on the 13th I observed a pair of Whitethroats near Scurmore in some briars on the roadside. On April 25th

Captain Kirkwood saw a White Wagtail on Bartragh, and a few days later a flock of ten birds arrived at their usual haunt—the marshy pasture outside the garden (where, if any are on the island, they are sure to be seen). This little flock remained there for nearly a week, until one day, when the north-east wind moderated, they disappeared, resuming their journey to Iceland. The weather continued so stormy that I was unable to go to Bartragh until the 15th (the only day since the first of the month when the tides suited, and calm enough for my small boat to face the estuary), so I lost my chance of seeing the Wagtails, as they had left before that date. The estuary was very free from birds, and I only observed half a dozen Sandwich Terns, and about as many Little Terns, but I saw a fair number of the Arctic, among which there may have been a few of the Common species, though I was unable to distinguish them. I got near a flock of about fifty Arctic Terns resting on the sands, and was much amused by the antics of the males trying to attract the females. On the Bartragh sands there was a flock of about fifty Dunlins with black breasts.—Robert Warren (Moy View, Ballina).

Notes on the Birds of West Renfrewshire (Caldwell District), 1908. —The chief feature of interest during 1908 was the great scarcity of the Sedge-Warbler. I am quite within the mark in saying that we had not more than one-third of our usual number. On the other hand, there was a marked increase in the number of Redshanks and Lapwings. Golden Plover, Snipe, and Dunlin nested in about the usual numbers. The following are the details:—

There were twenty-one degrees of frost on the night of Jan. 4th.

January 12th. Forty-two "Grey Geese" (species unknown) on Staneley Castle Loch. 21st. I heard the Song-Thrush in fine song as we passed Pollokshaws Station. So far they have not returned to Caldwell. 22nd. About one hundred Fieldfares flying about. The wind was out of the west and piercing cold. 23rd. Six Goosanders on Loch Libo. 24th. The Song-Thrush made its first public appearance for the season, and in fine song. The weather very mild. The six Goosanders still on the loch. 25th. A great fall in the temperature this morning, with several hail-showers. 27th. Five Goosanders on the loch. 28th. About eight inches of snow. 31st. A solitary Pied Wagtail.

February 1st. The snow almost gone. Twenty Redwings feeding in adjacent field. 3rd. Twelve Goosanders on Loch Libo. 9th. Blue Tits and Coal Tits plentiful; heard the welcome song of the Sky-Lark; also the "cooing" of the Ring-Dove. 11th. Four Goosanders on the loch. 12th. Three Goosanders to-day. I watched a Kestrel "hovering." 13th. About a score of Pochards on the loch. The woods now ringing with the songs of the Mavis. 14th. Four Goosanders. I heard the spring call-note of the Great Tit. 15th. Four Goosanders. 16th. Eleven Mallards and four Goosanders on the loch. 20th. Three Goosanders. It was very amusing to hear the Chaffinches attempting their full song. There were hundreds of them trying it, but I only once heard the complete song. This was the first morning I heard them. 21st. Six Goosanders on the loch. 22nd. A fearful blizzard to-day; wind, snow, hail, and sleet. 23rd. Storm continued this day. 24th. A beautiful day, with a cold wind blowing. My attention was called to the arrival of the Yellow Bunting by its song. 28th. Four inches of snow. A large flock of Lapwings gathered at Loch Libo this morning, as about the only bare place to be found. None of the birds were singing. 29th. Lapwings scattered about amongst the fields as if they had come to stay. Snow nearly gone.

March 4th. A flock of Herring-Gulls, about one hundred and fifty, resting in a field; nearly two-thirds of these were in immature plumage. The Curlew back in their nesting quarters. 9th. I learned that the Rooks were busy building a week ago. 12th. Four Goosanders; saw a Robin carrying nesting material. 13th. Saw the Redshank. Curlews now very plentiful. About two hundred Herring-Gulls. 15th. A solitary Magpie flew overhead. These beautiful birds are very scarce here. A Coot's nest nearly completed. 16th. This is the last day the Pochards were on Loch Libo. They have been much scarcer all winter than usual. 20th. The Golden Plover has returned. 21st. Twenty Golden Plovers, but only one has as yet the black breast. Meadow-Pipits appeared. 23rd. Six Goosanders and one Little Grebe on the loch. Wagtails (species unknown) kept flying north-west in singles, twos, and threes in a continuous stream. 24th to 28th. Four Goosanders remain all the time on the loch. 30th and 31st. Four Goosanders again on the loch. Wheatear seen on the 31st.

April 1st. About twenty Fieldfares. 5th. A pair of Tufted Duck on the loch. A solitary Goosander lay on the grass with one leg stretched full out, basking in the sun. About two hundred Fieldfares. 7th. Two White Wagtails and the first Bumble-Bee. 9th. Willow-Warbler. 12th. Three Willow-Warblers. 13th. Dipper's nest with five eggs. This is the same nest which contained two separate clutches last year, an experience which was repeated this year. 21st. Found a Dipper's nest with young ones fully half-grown. 24th. To-day brings records of frost varying from sixteen and twenty-four degrees. This must tell very severely on eggs that are lying about. 25th. Walked to-day from Turnberry to Girvan (Ayrshire) along the shore. Saw a single Great Grey Shrike. 29th. Sandpiper appears. This is the same date as last year. 30th. One Swallow in the morning and nine in the evening. More Sandpipers. Cuckoo heard several times to-day. A friend reports hearing it on the 27th.

May 1st. Swallows now in full numbers. Reed Buntings numerous. A Mallard's nest with ten eggs. 4th. Cuckoo now calling from every quarter. 6th. Water-Rail's nest with six eggs. 7th. Corn-Crake heard. Found a Red Grouse's nest with nine eggs, and one Curlew's nest. 9th. Saw the Wheatear, Yellow and Grey Wagtails, three nests of the Curlew, and one each of Teal and Red Grouse. 10th. Sedge-Warbler. 11th. Whitethroat. 15th. Whinchat. 18th. Spotted Flycatcher this morning, also nest of the Redshank and Red Grouse. 22nd. Visited the Gullery on the island in Harelaw Dam. Found one or two nests with four eggs each, one of which at least seemed all the product of the one bird (Black-headed Gull). One clutch of three eggs was taken which were not any larger than Tern's eggs. 23rd. Several young Curlews about. 31st. A Robin's nest in a tin can; my tin cans have been a great success with the Robins.

June 24th. Heard the Cuckoo for the last time.

July 6th. Nest of the Tree-Pipit, and young Whitethroats. 13th. Saw a nest of Whinchat. 14th. Two Coots are still sitting on their nests. 25th. Yellow Bunting in song. 27th. The last date on which I heard the Corn-Crake. 31st. Sedge-Warbler in song.

August 2nd. The Corn-Crake reported as being heard to-day. 6th. Six Herons at the loch to-day. 7th. A friend reports a very large flock of Starlings, about five thousand in number, flying from east to west. 8th. Told to-day of a pair of Bullfinches feeding four young. 24th. A large number of House-Martins and Swallows. 30th. Willow-Wren to-day.

September 4th. House-Martins are all gone. 12th. Ice this morning for the first time this autumn. 20. Put up forty-four Common Snipe at Loch Libo. 21st. Heard a Blackbird in fine song. 23rd. Still a few Swallows flying about. 27th. A Willow-Warbler flitting about amongst the raspberry bushes.

October 6th. About twenty Swallows reported flying around to-day. 13th. Pochards returned to the loch, this being their first appearance since the spring. 18th. Visited Loch Libo this morning and counted ninety-five Snipe, seven Mallards, forty-five Pochards, eleven Wigeon, and three Gadwalls; also flushed a Sparrow-Hawk. 22nd. Fifty-five Pochards and five Tufted Duck on the loch. 24th. Between two and three hundred Ducks on the loch to-day.

November 5th and 6th. Have seen Fieldfares both days. 8th. Severe frost during last night. At Loch Libo found about ninety Snipe, one hundred and twenty Pochards, eleven Tufted Duck, and five Goldeneyes. 9th. Three Goosanders to-day. 15th. Beautiful sunshiny morning after a touch of frost. Fieldfares plentiful, and a few Redwings. At Loch Libo found one hundred and ten Snipe, two hundred and twenty Pochards. There were four Sparrow-Hawks flying about.

December 6th. About two hundred and fifty Fieldfares. At the loch found one hundred and nineteen Snipe, one hundred and twenty Pochards, and a few Tufted Duck. Saw a solitary Kestrel. 23rd. Two Mistle-Thrushes in fine song at 7.50 a.m. From their behaviour I judged they were pairing, an observation afterwards confirmed by some friends. 26th. Mistle-Thrush again in fine song. About eight inches of snow to-day, a fitting close for the year.—T. THORNTON MACKEITH (The Hall, Caldwell, Renfrewshire).

Some Ornithological Notes from North-East Surrey.—The finest bird haunts in this portion of Surrey are undoubtedly the well-known Wimbledon Common and adjoining Richmond Park; in addition, the large reservoirs that lie between Putney and Hammersmith Bridges protect many interesting species of water birds during the winter. I have appended a few notes on some of the birds of the district:—

KESTREL.—This species is fairly common in district, nesting annually in Richmond Park. Watched one hovering over the reservoirs at Putney, Nov. 27th, 1908.

RED-BACKED SHRIKE.—Formerly bred on Wimbledon Common, but is only known there now as an occasional spring visitor; saw a pair for some days during early June, 1908, on Common; was rather disappointed that they did not stay to nest. Nearest regular nesting-place is, I believe, Banstead Downs.

REDWING.—A regular winter visitor with Fieldfares to Wimbledon Common; only occasionally seen in Richmond Park.

WHEATEAR.—Usually only known as a passing migrant in spring. First seen on Wimbledon Common this year, March 31st; they generally disappear by the second week in May. Saw a pair near the Penn Ponds, in Richmond Park, June 16th, 1908, probably a nesting pair. Occasionally seen during April on Barnes Common.

Golden-crested Wren.—A regular winter visitor to all parts of district, including Barnes Common; only occasionally seen during the nesting period.

Grey Wagtail.—A regular winter visitor to the riverside and reservoirs at Putney, usually arriving during the first week in October, departing in March. Only occasionally seen elsewhere in district, as Wimbledon Common, Richmond Park, and meadows near Raynes Park.

Tree-Pipit.—A fairly common summer visitor to Wimbledon Common and Richmond Park, arriving as a rule about April 12th.

Common Bunting.—I have not observed this species nearer London than Lower Morden and Worcester Park, where it is very common about the fields and hedges.

Hawfinch.—Occasionally seen on Putney Heath and Wimbledon Common; I do not know of its having bred recently in district.

Carrion-Crow.—Fairly common in district, especially about the river and reservoirs; it nests annually in some tall elms at Barn Elms, near Putney.

Swallow.—Usually arrives about April 10th, departing during the fourth week in October. On Nov. 26th, 1908, I was surprised at seeing one of these birds flying about the river near the Beverley Creek; the wind had been blowing from the south-west for some days, so probably this accounted for its very late appearance.

Kingfisher.—Occasionally seen along the Beverley near Kingston Vale; also usually seen during the winter on the reservoirs at Putney.

Common Sandpiper.—A regular spring migrant, stopping a week or two at Putney on its journey to northern breeding haunts. I have noted them on the following dates:—May 4th, 1907; April 24th, 1908; April 26th, 1909; also three on May 17th, 1909; all at riverside, Putney; April 13th, 1909, at Penn Ponds.

Dunlin.—A regular winter visitor to the reservoirs and riverside between Putney and Hammersmith Bridges. Last winter (1908-9) I saw as many as six of these rare visitors; they usually stay about two months in the vicinity of the reservoir.

Common Snipe.—Uncommon winter visitor; usually a few to be seen about some swampy grounds by the reservoir.

Heron.—There were quite forty nesting pairs of birds in the heronry in Richmond Park this year. They are regular visitors to the Putney reservoirs in the early morning.

Wigeon.—A common winter visitor to the reservoirs; as many as two hundred have been seen after severe weather.

TUFTED DUCK.—Usually about twenty of these little diving Ducks may be seen on the reservoirs during the winter.

GREAT CRESTED GREBE.—Resident in the district all the year round, nesting annually on the Penn Ponds, and during the winter they become quite numerous on the Putney reservoirs. Last winter as many as twenty of these handsome birds were congregated on the various reservoirs.

LITTLE GREBE.—Often seen on the Penn Ponds and on the river between Putney and Barnes. Nested successfully in the reservoir grounds in 1908.

COMMON GULL.—This species is becoming a much more numerous winter visitor; during the earlier portion of this year they became quite common on the Thames at Putney, &c. Noted one on the Penn Ponds during November, 1908.

LESSER BLACK-BACKED GULL.—Observed one on the river and reservoirs at Putney, April 24th–27th, 1908, my first record of this species in the district.—WILLIAM A. TODD (62, Festing Road, Putney).

"A List of the Zoological Gardens of the World."—Referring to the article on this subject by Capt. Stanley S. Flower in 'The Zoologist' (*ante*, p. 161), your contributor has omitted to mention the fact that there was a large zoological garden in Hull. This was opened in 1840, and consisted of about seven acres of land. It was situated on Spring Bank, and contained many valuable animals. In its latter days various non-zoological attractions were introduced to secure support, and the garden was abandoned about 1862, the site now being built upon. The fountains, "ruins," various trees, &c., which existed in the grounds were transferred to the Hull parks.—T. LENNARD (Municipal Museum, Hull).

OBITUARY.

EDWARD HAMILTON AITKEN.

THE death occurred at Mornington Place, Edinburgh, on Sunday, April 25th, of Mr. Edward Hamilton Aitken ("Eha"), a well-known writer on Indian Natural History.

Mr. Aitken was born in 1851 at Satara, where his father, the Rev. James Aitken, was a missionary of the Free Church of Scotland.

He was educated at Bombay and Poona. Passing the B.A. and M.A. examinations in Bombay University at the head of the list, he won the Homejee Cursetjee prize (poem) in 1880, and was Latin reader in the Deccan College from 1880 to 1886. Mr. Aitken then entered the Customs and Salt Department of the Civil Service, of which he rose to be head. He retired two years ago and settled in Edinburgh. Mr. Aitken wrote, under the *nom de plume* of "Eha," a number of books on Indian life and natural history, notably 'Tribes on my Frontier,' 'Behind the Bungalow,' 'Common Birds of Bombay,' and 'A Naturalist on the Prowl.' He was also the author of 'Five Windows of the Soul.'

Mr. Aitken, who was ill only two months, leaves a widow, two sons, and three daughters.

The Rev. H. Milnes, M.A.

Mr. H. Milnes, who was born seventy-seven years ago and died at Cheltenham on March 10th last, was a keen collector of British Mollusca, more especially the Land and Freshwater Shells; he also possessed a small collection of Exotics besides. Before coming to Cheltenham, where he had resided for several years, he was vicar of Winster, in Derbyshire, where he assiduously collected the Mollusca of that county, and as a result published, in 1893, a "List of the Land and Freshwater Shells of Derbyshire" in the 'Journal of Conchology,' to which periodical he was a casual contributor. But, though he published very little, he was a keen observer, of which the voluminous note-books which he continuously compiled constitute sufficient evidence. These, together with his collections, arranged in half a dozen small cabinets, have been presented to the Cheltenham Boys' College. As this institution is considerably overcrowded, and already in possession of a good representative Collection of Shells, and is besides liable to be closed to the public at any time, it is much to be regretted that the deceased did not bequeath the collection to the Town Museum in Clarence Street, which was only opened in the autumn of 1907, and is at present practically starving through want of support in the shape of donations. Mr. Jones, the Curator, informs me that he did approach Mr. Milnes some months before his decease with this object in view, but without success. This, I am given to understand, was chiefly in consequence of the chagrin which he manifested at the conspicuous absence of sympathy displayed towards Conchology, in this ostentatious educational centre, by the leisured classes, which was apparently less prominently the case half a century or so ago, especially during the Cuming era, when everybody of consequence considered it the correct thing to be in possession of at least a few examples of ornamental exotic shells. Now this is entirely changed, and the half-pay and retired officers who at the present time constitute a considerable proportion of the principal private residents of Cheltenham do not seem to possess either the means or inclination for pursuits of a purely scientific character. As, however, to my knowledge, there is nobody in connection with the College who is practically interested in Conchology, all the boys being as usual more or less attracted by football and other sports, I should not be surprised if many of the specimens are not in consequence eventually consigned to the dustbin; while, had the "pearls" been presented to the Town Museum, they would have been available for those who could appreciate them.

The deceased was a member of the Conchological Society of Great Britain and Ireland, as well as formerly of the Malacological Society of London, and served for a time on the Committee of the Conchological Club at Leeds. His entire library of conchological books, pamphlets, and reprints has been purchased by Messrs. Chamberlain & Co., of Gloucester.—W. HARCOURT-BATH.

WILLIAM H. EDWARDS.

THIS well-known American naturalist passed away at his home in Coalburgh, West Virginia, U.S.A., on April 14th, in his eighty-eighth year. He was born in Hunter, Greene County, New York, on March 15th, 1822. Graduating from Williams' College in the Class of 1842, he was admitted to the New York Bar in 1847. The year previous to this he made a voyage up the Amazon River to collect objects of natural history, and published 'A Voyage up the Amazon' (1847). He will, however, be best remembered by his 'Butterflies of North America,' in three volumes, commenced in 1868 and completed in 1897, a standard work of great merit. He was also the author of 'Shaksper, not Skakespeare' (1900).

NOTICES OF NEW BOOKS.

Mendel's Principles of Heredity. By W. Bateson, M.A., F.R.S., &c. University Press, Cambridge.

This volume describes a great factor in organic evolution. In the pages of 'The Zoologist' (1905, p. 240) a notice appeared of Mr. Punnett's excellent little work on "Mendelism." Prof. Bateson now details the principles on which that philosophical conclusion is based.

The conception of evolution is a very ancient one* ; when we understand its method we shall have discovered the working of the cosmic process. It is not to be enunciated by terms and definitions, nor demonstrated like one of Euclid's problems; neither is organic evolution the product of one factor, as apparently insisted on by those followers of a dogmatic Darwinism (certainly not that of its great master) who rigidly describe themselves as "selectionists." As Prof. Bateson wisely remarks, to Darwin the knowledge of Mendel's principles would have come "as a delight, that progress, even if in a direction unexpected by himself, had been made with that problem the solubility of which he was the first to make apparent to the world." In fact, the Mendelian factor supplements "Natural Selection"; even if it qualifies it does not invalidate that great teaching, and both factors together will still be followed by others yet to be, and which subsequently certainly will be discovered. The greatness of a theory is in its promotion of work in other directions, while the process of "Natural Selection" itself will weed out much of the doctrinal commentations and proposed axioms of some neo-Darwinians.

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* In the last issue of 'The Hibbert Journal' (vol. vii. p. 533), Ibn Ishak tells us that it is an old truth in Islam. It is taught in the Masnavi of Jalal ud Deen Rumi, who died A.H. 672, and is the belief of all Muslim mystics, and is founded on the teaching of the Kuran.

Prof. Bateson has described a mass of accurate observation and experiment, which fully entitles him to remark that "no one who is acquainted with Mendelian method will doubt that by its use practical breeders of animals and plants may benefit." At the same time this volume very considerably advances our conception of organic evolution, and will well repay the careful study and consideration of all who are interested in that great problem. There is still much to be done by the Mendelian method, the results of which may exceed reasonable expectation, and we gather from the pages of this book that in Cambridge alone there are enthusiastic workers, and of both sexes, who are energetically pursuing the investigation.

A Student's Text-Book of Zoology. By ADAM SEDGWICK, M.A., F.R.S. Vol. iii. Swan Sonnenschein & Co., Ltd.

WE welcome the third volume of this authoritative work on Zoology, which completes the Special Parts, and Prof. Sedgwick tells us that he is now in a position to turn his attention to the General Part. The second volume was noticed in 'The Zoologist' for 1905, so that the work cannot be described as hurried through the press. In this volume the chapters on Tunicata, Enteropneusta, Echinodermata, Onychophora, and Myriapoda are by the author; those on Arthropoda in General and on the Crustacea, and the section on the Xiphosura, are by Mr. Lister; those on the Insects and Arachnida being contributed by Mr. Shipley. That the order of the Phyla is not one universally followed—the Arthropoda being treated last—is discussed in the Preface, and, as Prof. Sedgwick remarks, "all zoological arrangements are compromises, and none of them can be, now or ever, entirely natural."

In his treatment of the Insecta, Mr. Shipley has not followed the sequence of Dr. Sharp in the Cambridge Natural History, of which he is a co-editor, but in this arrangement there is at present, and rightly, no finality. We still have much to learn on this question. At present—at least in this country—the dominant entomological drift is apparently towards speculative questions on the subject of mimicry, the evolutionary study by practical or morphological methods being in some desuetude.

Mr. Shipley's contribution belongs to the older and sounder method, one that will come to its own again, when original guessing will not be considered philosophical speculation. At the same time it is impossible to treat the Insecta in the confines of a section; the class, dealt with fully and universally, would require a series of volumes.

It is a great satisfaction that in this publishing era of "Nature Books" such works as the one under notice should be obtainable for reference by zoölogists. It has been well said that every book has many authors, and the authorities mentioned at the foot of each principal section support that suggestion. At the same time the reader will reflect that all would probably not make a precisely identical list; there might be a difference both in inclusion and exclusion.

A Treatise on Zoology. Edited by Sir Ray Lankester, K.C.B., M.A., LL.D., &c. Part VII. Appendiculata. Third Fascicle: Crustacea. By W. T. Calman, D.Sc. Adam & Charles Black.

The present volume is devoted to the Crustacea, is written by a specialist thereon, and adequately describes this large and important class of the Arthropoda from the morphological and developmental purview. We trust that Dr. Calman will in another publication as fully describe the Crustacea from the taxonomical, bionomical, and distributional standpoint. Even a new but authoritative volume on the British Crustacea will be appreciated.

To those who accept definitions as helps rather than dogmas, Dr. Calman's caution in this respect will find adherents in specialists on other classes of animal life. He writes of the Crustacea:—"The Class presents so wide a range of structural diversity that it is all but impossible to give, in a few words, a definition which shall apply to all its members." And after detailing his criteria he is compelled to add:—"But while these characters are found in the more primitive members, actual or hypothetical, of all the sub-classes and orders composing the Class, the more modified types furnish exceptions to every statement of the definition." This is the common experience of those who engage in monographic and faunistic work to any large or comprehensive extent, and constitutes one of the many evolutionary beacons which mark the course of developmental zoology.

Dr. Calman considers that the possession of stridulating organs by many Decapoda "is presumptive evidence that the animals do have some power of hearing"; by some writers this has been doubted, at least so far as regards stridulation in the Arachnida. The problem awaits demonstration, which will probably prove to be of an affirmative nature.

A strong feature in this volume is the historical account of the work achieved and the views held on the different orders by the older naturalists. If it is difficult in these days of extensive publication to keep in touch with contemporary investigation and results, it is also dangerous to ignore the views and conclusions (mistaken as many were) of those who preceded us. Our present structures are built on many old foundations.

EDITORIAL GLEANINGS.

At a meeting of the Linnean Society of New South Wales, held on October 28th, 1908, a letter from the West Australian Natural History Society at Perth was read, asking the Society's support in approaching the Government, with the object of having Barrow Island, sixty miles off the north-west coast, set apart as a Fauna Reserve. The island, which is remarkable for its Kangaroo (*Macropus isabellinus*), Bandicoot (*Perameles barrowensis*), Rat (*Mus furculinus*), and Wren (*Malurus edouardi*), none of which occur on the mainland, is likely to be leased for sheep-farming, to the detriment of the fauna. The President stated that, with the object of saving time, the Council had responded to the appeal by sending a communication to the Premier strongly supporting the movement. The wise policy of the Crown's retention of islands as sanctuaries for wild life was being amply justified by the experiences of New Zealand and the United States; and the Barrow Island fauna was worth an effort to save. After a copy of the Council's communication had been read, it was unanimously resolved, on the motion of Mr. Kesteven, seconded by Mr. Clunies Ross: "That this meeting heartily endorses the action of the Council, and hopes that the movement will be completely successful."

Mr. E. D. Hoben, editor of the 'Manawatu Daily Times,' Palmerston North, writes:—"I have been especially interested in the Eel discussion (*cf.* 'Zoologist,' *ante* p. 160), and have been corresponding with Mr. R. C. Bruce regarding it. Have any of your readers heard of the curious fact that there are no Eels in the waters on the western side of the dividing range in New South Wales, but plenty in the eastern waters, although the streams, in some cases, start within practically a few yards of each other?" Mr. T. Allan, of Avondale, Auckland Province, states that there are two creeks in his garden. They join and flow into a mud-flat. Large numbers of Eels live in the creeks and also in the bog close by. Along the course of the smaller creek there were some swamps or flats. Mr. Allan attempted to fill these up in order to get the water to run into only one channel. When digging the soil in the swamps he found countless numbers of small Eels which had been living in the place.—('Lyttelton Times' (Christchurch, N.Z.), May 1st, 1909.)

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